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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/682,275	10/08/2003	Daniel J. Zierath	42P15929	9333

8791 7590 09/21/2006

BLAKELY SOKOLOFF TAYLOR & ZAFMAN
12400 WILSHIRE BOULEVARD
SEVENTH FLOOR
LOS ANGELES, CA 90025-1030

EXAMINER

LEADER, WILLIAM T

ART UNIT	PAPER NUMBER
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1742

DATE MAILED: 09/21/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/682,275

Applicant(s)

ZIERATH ET AL.

Examiner

William T. Leader

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 June 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5, 7 and 9 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5, 7, 9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on June 29, 2006 has been entered.
2. Claims 6 and 8 have been canceled. Claims 1-5, 7 and 9 are pending.
3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 103

4. Claims 1-5, 7 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reid et al (US 2001/0015321) in view of the Lowenheim. Text *Electroplating*, Basol (6,921,551) and Mayer et al (6,946,065).
5. Reid et al and Lowenheim are interpreted and applied as in the previous office action. In summary, the Reid et al patent is directed to a method of electrodepositing copper onto a semiconductor substrate from a copper plating bath containing a suppressor, chloride ions, a leveler, and an accelerator ions in a manner in which defects in metal features are avoided. Reid

et al discloses the steps of determining the concentration of the suppressor additive, determining the concentration of the chloride ions, determining the concentration of the leveler, and determining the concentration of the accelerator. Reid discloses that the concentration of the suppressor is on the order of from 100 to 2000 mg/l (paragraph [0019] or 1-6 mg/l (Table 1); the concentration of chloride may be 20-200 mg/l (Table 1); the concentration of the leveler may be between 1 and 30 mg/l ([paragraph 0020]) or 0.5-8 mg/l (Table 1); and the concentration of the accelerator may be 0.5-8 mg/l (Table 1). The ranges overlap those disclosed and claimed by applicant. Reid et al show in figure 2 that it is known to evaluate the number of defects with respect to the composition of the electroplating bath.

6. Claim 1 differs from the process of Reid by reciting criteria on which the concentrations arrived at in determining steps are based. Applicant has amended claim 1 to recite the step of determining a concentration of a leveler and the step of determining a concentration of an accelerator. In the Remarks filed on June 29, 2006, applicant argues that the references of record do not suggest the step of "determining a concentration of an accelerator for the high-acid electroplating solution based upon the chloride concentration and the leveler concentration." The Basol patent is directed to electroplating a metal such as copper onto a semiconductor workpiece. Basol teaches that the plating bath may contain additives such as a suppressor and an accelerator, and that chloride is known to interact with these additives, affecting the performance of suppressing and accelerating species (column 11, lines 35-43).

7. The Mayer et al patent is similarly directed to the deposition of copper onto a semiconductor workpiece. Mayer et al disclose the use of a copper plating bath which contains

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additives of three general types: suppressor additives, accelerator additives and levelers. See column 8, lines 19-61. Mayer et al teach that the additives interact with each other (column 17, lines 7-8).

8. The prior art of record is indicative of the level of skill of one of ordinary skill in the art. It would have been obvious at the time the invention was made to have determined the concentration of the additives in the process of Reid et al so that chloride is present to catalyze the suppressor as taught by Lowenheim and to have determined the concentration of accelerator based on the chloride concentration and the leveler concentrations because it is known that additives interact with each other as taught by Basol and Mayer et al suggesting that the concentrations needed to achieve the benefits of the additives are interdependent.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William T. Leader whose telephone number is 571-272-1245. The examiner can normally be reached on Mondays-Thursdays and alternate Fridays, 7:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King, can be reached on 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

WL

William Leader
September 12, 2006

ROY KING
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700